

CHAPTER 7 - PRESSURE

7.1 Introduction

This chapter contains instructions on identifying, recording, and reporting pressure. It also describes the operation of pressure-measuring equipment.

7.2 Definitions

7.2.1 Altimeter Setting (ALSTG)

The pressure value to which an aircraft altimeter scale is set so it will indicate the altitude above mean-sea-level (MSL) of the aircraft on the ground at the location for which the pressure value was determined.

Altimeter Setting - $AP_H P_H P_H P_H$

A - International indicator for altimeter coded in inches of mercury.

$P_H P_H P_H P_H$ - Altimeter is coded in tens, units, tenths, and hundredths of inches of mercury

7.2.2 Field Elevation, H_a

The officially designated field elevation (H_a) of an airport above MSL. It is the elevation of the highest point on any of the runways of the airport.

7.2.3 Barometer Elevation, H_z

The height of the pressure instrument above MSL surveyed accurately within one foot. This height is posted on or immediately adjacent to the instrument.

7.2.4 Station Elevation, H_p

The officially designated height above sea level to which station pressure pertains. It is generally, but not always, the same as field elevation (H_a) at an airport station.

7.2.5 Station Pressure

The atmospheric pressure at the assigned station elevation. This pressure is *never* transmitted in a METAR/SPECI report.

7.2.6 Posted Pressure Correction

The value added algebraically to the reading obtained from the station's altimeter setting indicator (ASI, not aircraft-type altimeter) to correct it to a comparison standard.

7.2.7 Posted Height Correction

The correction, in feet, which must be added algebraically to the posted height (MSL) of an aircraft-type altimeter. This correction is indicated on the altimeter correction card furnished by the calibration station.

7.2.8 Sea-Level Pressure

The atmospheric pressure at mean sea level, either directly measured or obtained by the empirical reduction of station pressure to sea level. Where the earth's surface is above sea level, it is assumed that the atmosphere extends to sea level below the station and that the properties of the fictitious air column are related to conditions observed at the station.

7.3 Observing, Determining, and Reporting Procedures

7.3.1 General

An ASI, digital altimeter setting indicator (DASI), or aircraft-type altimeter, used to obtain altimeter settings, must be routinely compared and corrected as described in this chapter. The latest correction for each instrument used to determine altimeter setting shall be displayed on the instrument. The posted correction shall be added algebraically to the instrument's reading before reporting the altimeter setting.

7.3.2 Barometers Used

The altimeter setting is determined directly from an altimeter setting indicator. The following is a list of common pressure-measuring instruments:

- a. Precision Aneroid
- b. Altimeter Setting Indicator (ASI)
- c. Digital Altimeter Setting Indicator (DASI)
- d. Mercury Barometer
- e. Aircraft-type Altimeter [SAWRS only]
- f. PARASCIENTIFIC Inc., Digiquartz Pressure Transducer

The altimeter setting shall be reported in inches of mercury using four digits, e.g., A2992. The decimal is dropped. The altimeter setting is included in all METAR and SPECI reports. THE ALTIMETER SETTING IS NEVER ESTIMATED. It shall be missing (not reported) if the reading is questionable or the altimeters are out of service.

7.3.3 Altimeter Setting from ASI

- a. Tap the face of the instrument lightly with the finger to reduce the effect of friction on the pointer mechanism.
- b. Read the scale of the indicator at the pointer, to the nearest 0.005 inch, estimating values between the graduations.

- c. Record the altimeter setting determined by adding algebraically the posted correction, which has been determined from a comparison standard, to the reading and rounding the sum down to the next reportable value; i.e., 29.249 inches becomes 29.24.

7.3.4 Altimeter Setting from DASI

Record the altimeter setting determined from the digital display by algebraically adding the posted correction, which has been determined from a comparison standard, to the reading and rounding the sum down to the next reportable value; i.e., 30.019 inches becomes 30.01.

7.3.5 Aircraft-Type Altimeters

When used for the purpose of determining an altimeter setting, these altimeters must be installed and calibrated in accordance with the current FAA Advisory Circular 91-14. Use the following procedures to obtain the altimeter setting from an aircraft-type altimeter:

- a. Turn the knob of the altimeter until the hands indicate the actual height of the instrument (MSL). Apply any correction required by the correction card.
- b. Tap or vibrate the altimeter while resetting it to eliminate any lag due to friction in the mechanism.
- c. Recheck the setting after vibration, and reset if necessary.
- d. Read the altimeter setting to the nearest 0.01 inch from the pressure scale in the small window in the face of the altimeter.
- e. When two aircraft-type altimeters are used, read both instruments at the same time and use the lower reading as the altimeter setting.

7.3.6 Difference Between Coded Report and MF1M-10C Entries.

The altimeter group for the transmitted report starts with an A (the international indicator for altimeter in inches of mercury). When the altimeter setting is entered in column 13 of MF1M-10 it does not contain this designator, only the four-digit group.

Example: Transmitted: A3005

Column 13:

3005

7.4 Comparison for Determining Altimeter Reliability

Because of accuracy requirements for Altimeter Setting, it is important that comparison procedures described be followed. If, for any reason, you don't make the required comparisons or the tolerance limits are exceeded, omit the Altimeter Setting. Verify the reliability of each altimeter device using the following procedures.

7.4.1 Comparison of Two Aneroid Instruments at Station

At locations having two altimeter-setting instruments, ASI, DASI, aircraft-types, or combination, daily compare the altimeter settings obtained from the instruments. If the difference does not exceed .05, the instruments are considered reliable. If the difference exceeds .05 and the procedures in paragraph 7.4.2.1 or 7.4.2.2 cannot be used to determine the accurate instrument, the altimeter setting will not be reported. When both instruments are reliable, use the lower reading as the reported altimeter setting. Once every day on which observations are made, record the comparison between the two instruments in Column 65 of MF1M-10C (see paragraph 7.5.1).

7.4.2 Comparison if Only One Altimeter is Available on Station

If only one instrument is available, it must be compared with:

- a. The altimeters in an aircraft parked on a ramp adjacent to the weather observing station, (procedures are outlined in paragraph 7.4.2.1) or
- b. The altimeter at a NWS, FSS, AFSS, Contract, or LAWRS facility having a mercury barometer or an ASOS pressure transducer meeting distance, elevation, wind, and temperature criteria. Criteria are given in paragraph 7.4.2.2.

7.4.2.1 Comparison between Altimeter in the Station and Altimeter in an Aircraft

With this type of comparison, the aircraft must be maintained under the provisions of FAR (Federal Aviation Regulation) Part 121 or Part 135 and be equipped with two altimeters (captain's and first officer's). Make comparisons at least three different days each week, or daily if an aircraft is available. Use the following procedures:

- a. Determine the altimeter setting in the station using the procedure outlined in paragraph 7.3.3 for ASI, or paragraph 7.3.4 for DASI, or paragraph 7.3.5 for aircraft-type altimeters.
- b. With the aircraft's altimeters set to indicate their actual elevation (MSL), obtain the pressure scale reading of both the captain's and first-officer's altimeters to the nearest 0.01 inch. Determine the mean of these two readings.
- c. Compare the aircraft's mean altimeter setting with the reading of the station's altimeter.
- d. Log the difference between the station's altimeter and the mean of the aircraft's in Column 65 of MF1M-10C each time the comparison is made.

If the difference between the mean aircraft reading and the station reading exceeds 0.04 inch, do not report the altimeter setting until a future comparison shows the difference to be 0.04 inch or less. If the difference exceeds 0.04 inch on two successive comparisons, the altimeter must be re-calibrated before further use.

7.4.2.2 Comparisons with an Adjacent Station

Locations with only one altimeter instrument may compare their altimeter device against values obtained from an adjacent Weather Service Office (including WSCMO), Flight Service Station (including AFSS, Contract, FCWOS), or a LAWRS having a mercury barometer (Digiquartz may also be used), provided:

- a. At locations where precision approaches are conducted, the weather station is not more than 10 nautical miles away and, at both locations, the wind speed is 12 knots or less with no gusts above 15 knots.
- b. At all other locations, the distance must not exceed 25 nautical miles and, at both locations, wind speed must be 15 knots or less with no gusts above 20 knots.
- c. The difference in elevation does not exceed 100 feet at precision approach locations and 200 feet at all other locations.
- d. The station's temperature, at both locations, must be within 30°F of the Standard Atmosphere Temperature for the station's elevation.

Do not use altimeter-setting values from aneroid instruments when the difference exceeds .02 at precision approach locations or .05 at all other locations.

SAWRS, SAWRS II, and BSAWRS may compare with a commissioned ASOS or AWOS III if the criteria in 7.4.2.2 is met.

7.5 Recording Comparisons

Depending on the method used to compare aneroid devices, make entries in Column 65 as described in the following paragraphs.

7.5.1 Comparison of Altimeter Setting from Two Instruments

At stations determining altimeter-setting values from the lower pressure reading of two aneroid devices, neither located in an aircraft, enter in Column 65 of the MF1M-10C each day on which observations are taken: the reading of each instrument, the difference between the readings, and the date and time of readings; e.g., **ALSTG: INST #1 29.32 INST #2 29.33 DIFF .01, 25/1330.**

7.5.2 Comparison of Altimeter in Station with Aircraft's Altimeters

When an altimeter is compared with altimeters in an aircraft, enter in Column 65, MF1M-10C, the reading of the station's altimeter, the mean of the altimeters (pilot's and co-pilot's) in the aircraft, the difference between the station's and mean aircraft altimeter setting, and the date and time of the comparison (UTC); e.g., **ALSTG: STN 29.95 ACFT MEAN 29.94 DIFF .01 25/1200.**

7.5.3 Comparison of Station Altimeter with Adjacent Station

Enter in Column 65, MF1M-10C, the reading of your station's altimeter, the reading obtained from adjacent NWS, FSS, AFSS, Contract, or LAWRS, the difference between the readings, and the date and time of the comparison; e.g., **ALSTG: STN 29.96 KBOS 29.94 DIFF .01 24/1500.**

7.6 Reporting Procedures

Instrument Compared	Differences Must Not Exceed	Determining the Altimeter Setting
Two altimeter-setting instruments, ASI, DASI, or aircraft-type altimeters, or combination, located in office. Compare Instruments #1 and #2 (paragraph 7.4.1). Make daily comparisons.	.05 inches	If the difference is within limits, use the instrument with the lower reading for the altimeter setting. If the difference exceeds limits, do not report the altimeter setting if the accuracy of the instrument cannot be determined (paragraph 7.4.2.1 and 7.4.2.2).
One altimeter-setting instrument, ASI, DASI, or aircraft-type altimeter compared with the altimeter setting from an adjacent NWS, AFSS/FSS, LAWRS or Contract office meeting the criteria in paragraph 7.4.2.2. Make daily comparisons.	.02 inch at precision approach locations, or .05 inch at all other locations.	If the difference exceeds limits, do not report the altimeter setting.
One altimeter-setting instrument, ASI, DASI, or aircraft-type altimeter compared with mean value of the two altimeters (pilot's and co-pilot's) in an aircraft parked on the ramp adjacent to the weather station (paragraph 7.4.2.1). Make comparisons daily if an aircraft is available, otherwise at least three times a week.	.04 inches	If the difference exceeds limits, do not report the altimeter setting.

Table 7-2. Comparison of Aneroid Devices

REVIEW QUESTIONS

1. Altimeter setting is recorded in:
 - a. hectopascals
 - b. millibars
 - c. inches of mercury
 - d. centimeters of mercury
2. Altimeter setting is reported:
 - a. in all METAR/SPECI reports
 - b. in the remarks section of all METAR reports
 - c. in METAR reports only
 - d. in SPECI reports only
3. Pressure values are rounded _____ to the next reportable value.
 - a. down
 - b. up
 - c. either up or down
 - d. carefully
4. An altimeter reading is 29.948 inches. This is recorded in col. 13 as:
 - a. 2995
 - b. 2994
 - c. 29.95
 - d. 29.94
5. An altimeter setting of 28.966 would be reported as:
 - a. 2896
 - b. 2897
 - c. LOW 2896
 - d. 2897 LOW
6. An altimeter reading of 30.544 inches would be rounded to:
 - a. 30.545
 - b. 30.544
 - c. 30.50
 - d. 30.54

REVIEW QUESTIONS

7. Which of the following elements can not be estimated?
- a. Sky Condition
 - b. Visibility
 - c. Present Weather
 - b. Altimeter Setting
8. Your station's ASI indicator needle reads one inch past the highest scale reading on its face (31.00). However, you estimate the reading to be 31.283. How would this be recorded in Column 13 (Altimeter Setting) of MF1M-10C?
- a. omitted
 - b. 31.28
 - c. A3128
 - d. 3138
9. Which of the following elements can not be estimated.
- a. Wind Direction
 - b. Visibility
 - c. Altimeter Setting
 - d. Wind Speed